

$$\sum_{i=1}^n d_i x_i K(\vec{x}, \vec{x}_i)$$

$$\sum_{i=1}^n d_i x_i (1 + \vec{x}^T \vec{x}_i)^2$$

$$d_1 x_1 \cdot (1 + x_1^2 x_{11}^2 + 2x_1 x_2 x_{11} x_{12} + x_2^2 x_{12}^2 + 2x_1 x_{11} + 2x_2 x_{12}) +$$

$$- d_2 x_2 \cdot (1 + x_1^2 x_{21}^2 + 2x_1 x_2 x_{21} x_{22} + x_2^2 x_{22}^2 + 2x_1 x_{21} + 2x_2 x_{22}) +$$

$$d_3 x_3 \cdot (1 + x_1^2 x_{31}^2 + 2x_1 x_2 x_{31} x_{32} + x_2^2 x_{32}^2 + 2x_1 x_{31} + 2x_2 x_{32}) +$$

$$d_4 x_4 \cdot (1 + x_1^2 x_{41}^2 + 2x_1 x_2 x_{41} x_{42} + x_2^2 x_{42}^2 + 2x_1 x_{41} + 2x_2 x_{42})$$

$$-1 \cdot \frac{1}{8} \cdot (1 + (-1)^2 x_1^2 + 2x_1 x_2 (-1) \cdot (-1) + x_2^2 \cdot (-1)^2 + 2x_1 \cdot (-1) + 2x_2 \cdot (-1))$$

$$= -\frac{1}{8} (1 + x_1^2 + 2x_1 x_2 + x_2^2 - 2x_1 - 2x_2)$$

$$\rightarrow \frac{1}{8} (1 + x_1^2 (-1)^2 + 2x_1 x_2 (-1)(1) + x_2^2 \cdot 1^2 + 2x_1 \cdot (-1) + 2x_2 \cdot 1)$$

$$= \frac{1}{8} (1 + x_1^2 - 2x_1 x_2 + x_2^2 - 2x_1 + 2x_2)$$

$$\frac{1}{8} \left(1 + x_1^2 \cdot 1^2 + 2x_1x_2 \cdot (1) \cdot (-1) \right. \\ \left. + x_2^2 \cdot (-1)^2 + 2x_1 \cdot 1 + 2x_2 \cdot (-1) \right)$$

$$= \frac{1}{8} \left(1 + x_1^2 - 2x_1x_2 + x_2^2 + 2x_1 - 2x_2 \right)$$

$$- \frac{1}{8} \left(1 + x_1^2 \cdot 1^2 + 2x_1x_2 \cdot 1 \cdot 1 \right. \\ \left. + x_2^2 \cdot 1^2 + 2x_1 \cdot 1 + 2x_2 \cdot 1 \right)$$

$$= -\frac{1}{8} \left(1 + x_1^2 + 2x_1x_2 + x_2^2 + 2x_1 + 2x_2 \right)$$

Gesamt:

$$-\frac{1}{8} + \frac{1}{8}x_1^2 - \frac{1}{4}x_1x_2 - \frac{1}{8}x_2^2 + \frac{1}{4}x_1 + \frac{1}{4}x_2$$

$$+ \frac{1}{8} + \frac{1}{8}x_1^2 - \frac{1}{4}x_1x_2 + \frac{1}{8}x_2^2 - \frac{1}{4}x_1 + \frac{1}{4}x_2$$

$$+ \frac{1}{8} + \frac{1}{8}x_1^2 - \frac{1}{4}x_1x_2 + \frac{1}{8}x_2^2 + \frac{1}{4}x_1 - \frac{1}{4}x_2$$

$$- \frac{1}{8} - \frac{1}{8}x_1^2 - \frac{1}{4}x_1x_2 - \frac{1}{8}x_2^2 - \frac{1}{4}x_1 - \frac{1}{4}x_2$$

$$0 \quad 0 \quad -x_1x_2 \quad 0 \quad 0$$

$$\Rightarrow -x_1x_2$$